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PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 2462-2645

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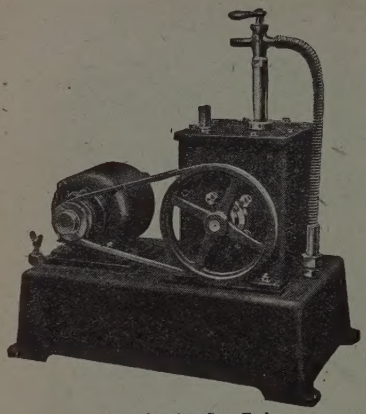

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MATHEMATICS

2462 511.473

On the solution of the "easier" Waring problem. BENERJEE, D. P. *Bull. Calcutta Math. Soc.*, 34, *pp.* 197–199, *Dec.*, 1942.—Defining $v(k)$ as the least value of s such that every integer n can be expressed in the form $n = x_1^k + x_2^k + \ldots + x_r^k - x_{r+1}^k \ldots - x_s^k$, where r, k, x_1, x_2 . . . are integers, $0 \leqslant r \leqslant s$, upper and lower bounds of $v(k)$ for $21 \leqslant k \leqslant 30$ are found.

2463 512.25

On the iterative solution of linear simultaneous equations. FREEMAN, G. F. *Phil. Mag.*, 34, *pp.* 409–416, *June*, 1943.—By arranging a set of linear simultaneous equations in an order which gives reasonably rapid convergence of iterative solutions, and taking early approximations to a min. number of significant figures, much labour may be saved. Any errors are automatically "ironed out" by the subsequent processes. If the successive approximations oscillate, a more rapid convergence may be obtained by a variation in which a weighted mean between the $(n-1)$th and nth approximations is used in iterating for the $(n+1)$th approximation; there is a corresponding system for a non-oscillating series. Numerical examples are given. [See Abstr. 2478 (1941).

G. F. F.

2464 513.567

On a certain quartic scroll associated with a pair of given lines and two given quadrics. CHARIAR, V. R., AND CHATTERJI, N. *Bull. Calcutta Math. Soc.*, 34, *pp.* 183–185, *Dec.*, 1942.

2465 513.735.9

On a case of the cross-ratio system of a 3-web. CHOUDHURY, A. C. *Bull. Calcutta Math. Soc.*, 34, *pp.* 177–181, *Dec.*, 1942.—The note discusses the case of the cross-ratio system containing a hexagonal 3-web and generated by another hexagonal 3-web. The cross-ratio system is reducible to straight lines in this case.

2466 513.737 = 4

On the real representation of an imaginary sphere by means of ruled space. SAUSSURE, R. DE. *Arch. Sci. Phys. Nat.*, 25, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 60, *pp.* 36–39), 1943.

2467 513.83

On infinite dimensional linear spaces. MACKEY, G. W. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 216–221, *July*, 1943.

2468 517.512.4

Bessel summation of series. CHANDRASEKHARAN, K. *Proc. Indian Acad. Sci. A*, 17, *pp.* 219–229, *June*, 1943.—The Bessel method of summation, or the (J_μ, λ) process, was first introduced by Minakshisundaram as a means of summing series of eigenfunctions in boundary-value problems. The possibility of interrelating it with other known processes is studied.

2469 517.512.4

The absolute Bessel-summability of series. CHANDRASEKHARAN, K. *Bull. Calcutta Math. Soc.*, 34, *pp.* 187–196, *Dec.*, 1942.—The paper defines abs. J_μ summability and proves results in abs. summation analogous to those established for ordinary J_μ summation. [See *J. Indian Math. Soc.*, 4, p. 168, 1942].

2470 517.564.3

Concerning the roots of $J_n'(x)N_n'(kx) - J_n'(kx)N_n'(x) = 0$. TRUELL, R. *J. Appl. Phys.*, 14, *pp.* 350–352, *July*, 1943.—The relation $J_n'(x)N_n'(kx) - J_n'(kx)N_n'(x) = 0$ arises in resonant-cavity problems. The first roots of this relation are presented as a function of k for $n = 1, 2, 3\ 4$. The M'Mahon relation does not allow calculation of the first roots. The functions $J_n'(x)/N_n'(x)$ have rel. max. at $x = n$ except for $n = 0$.

See Abstr. 2471 517.564.3 : 517.65

2471 517.65 : 517.564.3

Infinite integrals involving Bessel functions (II). MOHAN, B. *Bull. Calcutta Math. Soc.*, 34, *pp.* 171–175, *Dec.*, 1942.

2472 517.933

On certain non-linear differential equations of the second order. LEVINSON, N. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 222–223, *July*, 1943.

2473 517.947.4 : 518.6

A general experimental solution of Poisson's equation for two independent variables. HOGAN, T. K. *J. Instn Engrs, Aust.*, 15, *pp.* 89–92, *April*, 1943.—In order to solve Poisson's equation for any boundary conditions the author has developed an electrical integraph based on the analogy of a resistance network to a finite-difference mesh.

2474 518.3 : 526.774

Nomograms for computing tidal gravity. ELKINS, T. A. *Geophysics*, 8, *pp.* 134–145, *April*, 1943.—Two types of nomograms [Abstr. 2251 (1941)] are explained and illustrated, (1) for computations at a fixed latitude on the earth; (2) for computations at a fixed point. The accuracy of these nomograms is studied and a comparison is made with one recently devised [Abstr. 2079 (1943)].

See Abstr. 2473 518.6 : 517.947.4

2475 519.24

Trend analyser. PILLAI, K. C. S. *Proc. Indian Acad. Sci. A*, 17, *pp.* 187–194, *June*, 1943.—The methods of moving averages, of differences, of least squares, and of orthogonal polynomials are discussed with the help of a numerical example and a novel method of getting the trend by a mechanical device is given. [See Abstr. 97 (1939)].

2476 519.44

Groups containing four and only four non-invariant subgroups. MILLER, G. A. *Proc. Nat. Acad. Sci., Wash.*, 29, *pp.* 213–215, *July*, 1943.—Some transformation theorems are established.

2477 519.443

Contributions to the theory of ordered groups. LEVI, F. W. *Proc. Indian Acad. Sci. A*, 17, *pp.* 199–201, *June*, 1943.—Necessary and sufficient conditions that a given group may be ordered, are investigated. It has been stated [Abstr. 1308 (1943)] that in an ordered group the condition (*a*): every element $\neq 1$ is

of infinite order, is satisfied and that every group in which (*b*) the commutator group lies in the centre, and (*a*) is satisfied, can be ordered. The necessary condition (*a*) is not sufficient and the sufficient condition (*b*) is not necessary.

ASTRONOMY. GEODESY

2478 521.11

Dynamical friction. III. A more exact theory of the rate of escape of stars from clusters. CHANDRASEKHAR, S. *Astrophys. J.*, 98, *pp.* 54–60, *July*, 1943.—[Abstr. 1849 (1943)]. A more exact estimate of the rate of escape of stars from clusters is made by allowing for the dependence of the coeff. of dynamical friction on the velocity. The probability that a star will have acquired the necessary velocity of escape (assumed to be = 2 × r.m.s. velocity of the stars in the system) in a time τ (measured in units of the time of relaxation of the system) is given by $Q(\tau) = (1 - e^{-0.0075\tau})$. On this basis, $\frac{1}{2}$-lives for galactic clusters of the order of 3×10^9 years are provided for, and it is concluded that dynamical friction provides the principal mechanism for the continued existence of galactic clusters like the Pleiades for times of the order of 3×10^9 years.

2479 522.1

Reports on the progress of astronomy. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *pp.* 86–115, 1943.—Report containing the following papers: Cometary spectra, Swings, P. [Abstr. 2494 (1943)]; Comets, Davidson, M. [Abstr. 2492 (1943)]; Sunspots, 1942, Newton, H. W. [Abstr. 2495 (1943)]; Prominences, 1941, 1942, Narayan, A. L. [Abstr. 2498 (1943)]; Double stars, Bos, W. H. van den [Abstr. 2502 (1943)]. A. HU.

2480 522.1 : 523.99

Observations of occultations at Sydney Observatory during 1942. *Mon. Not. Roy. Astr. Soc.*, 103, 3, *p.* 169, 1943.

2481 522.1 : 523.991

Occultations of stars by the Moon observed at the Nizamiah Observatory, Hyderabad, during the year 1942. *Mon. Not. Roy. Astr. Soc.*, 103, 3, *pp.* 167–168, 1943.

See Abstr. 2482 522.91 : 523.13

2482 523.13 : 522.91

Non-solar planets. HUNTER, A. *Nature, Lond.*, 152, *pp.* 66–67, *July* 17, 1943.—The gravitational effect of a planetary companion to a star can in certain circumstances be detected from careful observations of the position of the primary. Two recent discoveries of stellar companions of mass about $\frac{1}{100}$ that of their primaries are discussed, and it is pointed out that systematic observations of present-day accuracy could decide within a relatively short time whether a planetary system is a frequent or a rare cosmic phenomenon. A. HU.

2483 523.5

Cataclysm and evolution. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 27–29, 1942.—Encounters by the Earth with planetoids are suggested as an explanation of geological revolutions. Such collisions would have been responsible also for the cataclysmic destruction of species.

2484 523.51

The great meteor of 1941 June 28. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 1–5, 1942.—A report of observations by 4 scientists more than 200 miles from the vanishing point of the meteor.

2485 523.51

A new aerolite from Stonington, Colorado. BUDDHUE, J. D. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 6–8, 1942.

2486 523.51

The Great Siberian meteorite of 1908: possibly a comet that struck the Earth (Review). *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 29–30, 1942.

2487 523.51

The aerolitic fall of Rancho de la Presa, Zenapecuaro, Michoacan, Mexico. NININGER, H. H. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 37–38, 1942.

2488 523.51

The compressive strength of meteorites. BUDDHUE, J. D. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 39–40, 1942.—The compressive strength of 8 stones, ranging from 900 to 54 000 lb./in.^{2}, is reported.

2489 523.51

Nitrogen and its compounds in meteorites. BUDDHUE, J. D. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 59–61, 1942.—Mention is made of free N, Ti_2N_2, CN and previously reported occurrences of NH_3 compounds in meteorites. NH_3 is present in all of the 8 meteoritic stones tested. A new method of analysis is described which was used to determine the amount of NH_3 in stones of 5 falls.

2490 523.51

The Enon, Ohio, meteorite (mesosiderite). NININGER, H. H. *Contr. Soc. Res. Meteorites*, 3, 1, *pp.* 61–62, 1942.

2491 523.531

An analysis of British meteor data. PORTER, J. G. *Mon. Not. Roy. Astr. Soc.*, 103, 3, *pp.* 134–153, 1943.—With a view to a complete statistical analysis of the true paths of meteors, a collection of 1 253 accordances has been made, and these have been reduced by a std. method. A study of 61 multiple accordances has given values for the angular errors made by the observers, and preliminary figures for the errors in path, height, magnitude, and speed. A discussion of the previously published paths of Denning and others shows the unsuitable nature of this material for statistical purposes. The improvement due to the technique introduced by Prentice is made apparent. A system of weighting has been envolved for radiants and heights.

2492 523.63

Comets. DAVIDSON, M. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *pp.* 111–112 *and* 113, 1943.—Progress report. A. HU.

2493 523.671

Rotational distribution of CH molecules in the nucleus of Comet Cunningham (1940c). MCKELLAR, A. *Astrophys. J.*, 98, *pp.* 1–5, *July*, 1943.—From the observed profile of the λ4 315 $^2\Delta$, $^2\Pi$ CH band in the spectrum of Comet Cunningham at heliocentric distance $r = 0{\cdot}54$ astronomical unit, the distribution of

molecules on the rotational levels of the upper $^2\Delta$ state is found. From this, assuming the resonance mechanism for the production of the band, the distribution among the rotational levels of the normal $^2\Pi$ state is derived. Nearly all the molecules exist in the lowest rotational levels.

2494 523.672

Cometary spectra. SWINGS, P. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *pp.* 86–111, 1943.—The progress made in 1940–42 in explaining the spectra of the heads of comets is reviewed. Three diatomic molecules (OH, NH, CH^+) and one triatomic (CH_2) have been identified by improving the ultra-violet observations and by additional laboratory work. Anomalous rotational structures are now attributed to the absence from the exciting radiation (sunlight) of certain wavelengths (strong Fraunhofer lines). The impact of these recent discoveries on general cometary physics is described, and a programme of future work laid down in which observations in the red and infra-red figure prominently. A. HU.

2495 523.746

Sunspots, 1942. NEWTON, H. W. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *p.* 112, 1943.—Progress report. A. HU.

2496 523.746

Systematic fluctuations of the characteristics of sunspot cycles. GLEISSBERG, W. *Observatory*, 65, *pp.* 24–27, *May*, 1943.

See Abstr. 2631 523.746 : 550.384

See Abstr. 2641 523.746 : 551.543.4

2497 523.752

The properties of solar prominences as related to type. PETTIT, E. *Astrophys. J.*, 98, *pp.* 6–19, *July*, 1943.—Prominence types are discussed according to their association with sunspots and their origin, motion and structure. The author's original classes are retained: active (I), eruptive (II), sunspot (III), tornado (IV), and quiescent (V), but V is placed first from the evolutionary point of view, and class VI (coronal) added. The classes are subdivided and arranged diagrammatically to show connected characteristics. Typical photographs are reproduced showing the evolution of several of the types. A. HU.

2498 523.752

Prominences, 1941, 1942. NARAYAN, A. L. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *pp.* 113–115, 1943.—Progress report. A. HU.

2499 523.77

The stronger lines of singly ionized dysprosium and identifications in the solar spectrum. KING, A. S., AND MOORE, C. E. *Astrophys. J.*, 98, *pp.* 33–34, *July*, 1943.—Table 1 lists 527 of the stronger lines of Dy II in the spectral range $\lambda\lambda$2 970–8 280. A large proportion of these lines appear in the high-temperature furnace; their furnace intensities, supplementing those in the arc and spark, indicate, in the absence of term-analysis, the rel. levels from which the lines arise. The solar spectrum was examined for the presence of 95 selected lines whose laboratory behaviour indicated a low-level origin. Of these, 57 were identified in the sun, in part as members of blends. Of the others, 20 are masked and 18 absent.

2500 523.821.2

Photovisual magnitudes of southern stars. COUSINS, A. W. J. *Mon. Not. Roy. Astr. Soc.*, 103, 3, *pp.* 154–159, 1943.—Photovisual magnitudes of more than 100 stars in the s. hemisphere have been determined, using Fabry's method. The scale and zero point have been standardized against the brighter stars of the Pleiades, using Calder's magnitudes. There are differences of scale and zero point and a large colour coeff. when compared with visual magnitudes reduced to the Harvard Photovisual System. The mean error of a mag. is believed to be of the order of $+ 0^m{\cdot}02$.

2501 523.841.374.4

A study of the radial velocity of β Cephei. SMITH, B. *Astrophys. J.*, 98, *pp.* 82–90, *July*, 1943.—The study is based on measurements of 91 Yerkes plates (1940–1942) and presents a review of all published radial-velocity measurements of this star. The average period of β Cephei is slowly lengthening, the increase amounting to 0·43 sec. during the last 25 years. From the form of the velocity curve of the centre of mass it appears probable that β Cephei is the bright component of a binary with a period of 50 years and an eccentricity 0·66. An abrupt change in the length of P occurred coincident with the close approach of the two components at periastron in 1914–1916. After periastron the period began to lengthen and is now best represented by $P = 0{\cdot}1904886$ day.

2502 523.842

Double stars. BOS, W. H. VAN DEN. *Mon. Not. Roy. Astr. Soc.*, 103, 2, *p.* 115, 1943.—Progress report. A. HU.

See Abstr. 2509 523.842.3 : 523.872

2503 523.851

NGC 5053 and NGC 6838. CUFFEY, J. *Astrophys. J.*, 98, *pp.* 49–53, *July*, 1943.—A photometric survey of these clusters results in colour-magnitude relations which confirm that the former is a well-resolved globular cluster and the latter a condensed galactic cluster. The giant stars of NGC 6838 are red and become bluer with decreasing brightness; in this respect, as well as in structure and richness in faint stars, this cluster resembles a globular cluster, showing that the boundary between the 2 types is poorly defined. The distances, corrected for absorption, are: NGC 5053, 16 000 psc.; NGC 6838, 4 000 psc. The linear diameters are both about 30 psc. A. HU

2504 523.851.3 : 523.872

A spectroscopic study of the region of the double cluster in Perseus. BIDELMAN, W. P. *Astrophys. J.*, 98, *pp.* 61–81, *July*, 1943.—Spectral classes and abs. magnitudes are derived from low-dispersion spectrograms for 153 early-type stars near h and χ Persei. True distance moduli found from photo-electric colours indicate that around the double cluster there is a cluster, 5° in dia., of early-type supergiants. On the basis of abs. magnitude, radial velocity and interstellar line intensity, many of the stars investigated are attributed to the cluster, and the distance is found to be 1 920 psc. The fainter stars near the cluster centre show rotationally broadened lines, and some show emission. Highly luminous stars of other types (e.g. M-type irregular variables) appear in the same region. A. HU.

2505 523.852

Galactic absorption and star distribution. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 103, 3, *pp.* 160–166, 1943.—A comparison of observed densities with the density function, got by solving the fundamental equation of star counting by means of an assumed luminosity function, is limited by the limits of our knowledge of abs. mag. or proper motions of the stars observed. An extension is possible by using colour indices, which can be determined down to the lim. apparent star magnitudes of the photographs. Colour indices and app. mag. are affected by absorption. A relation is established betw. true and app. densities in such a case. A transformation factor is deduced, using an analytical expression for the *M–C* curve, and assuming uniform galactic absorption. This factor, applied to the density function, permits the comparison of obs. and computed densities. [See Abstr. 1191 (1941) and 998 (1942)].

2506 523.872

Spectrographic observations of peculiar stars. VI. SWINGS, P., AND STRUVE, O. *Astrophys. J.*, 98, *pp.* 91–97, *July*, 1943.—[See Abstr. 2133 (1943)]. Large changes have been observed in the spectrum of T Coronae Borealis. Many absorption lines were measured on spectrograms of January, 1943. The high members of the Balmer series consist of 2 emission components separated by a central absorption; the blue component is appreciably stronger than the red. AX Persei is increasing in excitation, while Z Andromedae is declining, following its peak in the summer of 1942. HD 45677 has changed since 1939. In 1943 the H absorption cores were much weaker than in 1939, and the H emission lines showed only red components. The shell-absorption lines of Ca II had also become weak. 31 Be stars from the Mt. Wilson catalogues have been observed. The stars MWC 47, MWC 120, MWC 158, Mt. W. 265, and Mt. W. 275 present interesting shell-absorption spectra. The star MWC 93 has lost most of the expanding-shell characteristics observed by Merril between 1928 and 1930.

2507 523.872

The spectrum of 48 Librae (HD 142983). STRUVE, O. *Astrophys. J.*, 98, *pp.* 98–115, *July*, 1943.—The star shows a strong metallic absorption spectrum which has developed during the last 10–20 years. This spectrum shows appreciable dilution in the intensities of Mg II and Si II. The H lines consist of sharp cores superposed over broad wings. Hβ and Hα are bright. The sharp-line spectrum is attributed to a shell which resembles in the rel. intensities of Ni II, Fe II, Cr II and Mn II the shell of Pleione (1940). The Balmer jump in the shell of 48 Librae is more conspicuous. The shell is transparent in the ordinary photographic region but opaque on the violet side of λ3 650. The strong shell lines are sharp but unsymmetrical, while the weaker lines are diffuse. This suggests stratification. The radial velocity is variable.

2508 523.872

Calcium II emission in v Sagittarii. WEAVER, H. F. *Astrophys. J.*, 98, *p.* 131, *July*, 1943.

See Abstr. 2504 523.872 : 523.851.3

2509 523.874 : 523.842.3

Spectrographic orbital elements and relative luminosities of the components of H.D. 203858. PATTEN, C. G., AND MCKELLAR, A. *J. Roy. Astr. Soc. Can.*, 37, *pp.* 205–215, *May–June*, 1943.—This star is a 2-spectrum binary [Abstr. 2762 (1938)] and 29 spectrograms have been secured at the Dominion Astrophysical Observatory since 1926. Orbital elements are derived by Sterne's method; a circular orbit is adequate to represent the observations. The rel. luminosities of the components are determined, and an estimate of the abs. dimensions of the 2 stars and their orbits shows that they are A1 stars of somewhat above average luminosity. A. HU

See Abstr. 2480 523.99 : 522.1

See Abstr. 2481 523.991 : 522.1

2510 526.77

A rapid method for measuring the profile components of horizontal and vertical gravity gradients. HEILAND, C. A. *Geophysics*, 8, *pp.* 119–133, *April*, 1943.—The high resolving power of the torsion balance is combined with speed of operation in a new balance in which profile components of gradients are measured at rt. angs. to the assumed strike. The torsionless position is held const. with temperature control, and the period and observation time are reduced to 3 or 4 min. by decreasing the mechanical sensitivity and increasing the optical magnification. A beam arrangement gives the gradient in only 1 azimuth and the profile gradient of horizontal gravity in a second azimuth if required. A. HU

See Abstr. 2474 526.774 : 518.3

2511 526.98

Suggestions for making topographic sketches from contour maps. WHITE, W. A. *Amer. J. Sci.*, 241, *pp.* 491–497, *Aug.*, 1943.—Two methods are presented for making topographic drawings from contour maps without the aid of pantographic devices to foreshorten the contours. One method uses an oblique photograph to obtain foreshortening. The other uses a vertical photograph and an inclined projection of it.

See Abstr. 2579 527 : 538.7(09)

PHYSICS: GENERAL

2512 53 : 616.314

Physical properties of dental materials. SOUDER, W., AND PAFFENBARGER, G. C. *Circ. U.S. Bur. Stand. No.* 433, [222 *pp.*], 1942.—The publication assembles data from reports on dental materials and techniques. It deals specifically with amalgam, gold alloys, denture base resins, cements, investments and impression materials. Details of test methods and data from previous publications are included. The data are discussed under two headings, theoretical significance and technical applications.

2513 530.12

The external field of a radiating star in general relativity. VAIDYA, P. C. *Curr. Sci.*, 12, *p.* 183, *June*, 1943.

2514 530.12 : 531.51

The general unitary theory of the physical fields. SCHRÖDINGER, E. *Proc. Roy. Irish Acad.*, 49*A*, 3, *pp.* 43–58, *July*, 1943.—The basis of the theory is the introduction of a symmetrical affine connection and of a Lagrangian which is a function of the contracted curvature tensor of the connection. The Hamiltonian variation of this Lagrangian with respect to the

oefficients of the connection yields the field equations. he further assumption is made that the coefficients of ne connection are functions of the components of the netrical tensor, and it is proved that they also involve ertain other quantities which can eventually be dentified with the current density. The resulting field quations combine the gravitational and electro-nagnetic field equations but the usual energy tensor s replaced by the energy tensor of the electromagnetic ield. A special form of Lagrangian is discussed which involves a certain const. If it is supposed that his const. can have one or other of 2 values (and herefore that there are 2 connections present), both he electromagnetic and the meson fields can be in-luded in the theory. G. C. McV.

2515 531.25 = 3

New methods of analytical statics in linear problems. AMSTUTZ, E. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 101–109, *April*, 1943.—The usual calculations of beam statics are solved after transformation into algebraic formulae. Two methods are developed from which the linear differential equation that occurs most frequently in the statics of beams may be solved numerically by algebraic operations. One of these methods is applied to solve homogeneous differential equations as used in the solution of stability problems. The methods described are not confined to problems on the statics of buildings. G. E. A.

2516 531.258

A note on stress systems in aeolotropic materials. I–II. GREEN, A. E. *Phil. Mag.*, 34, *pp.* 416–422, *June*, 1943.—The author gives a general equation to a stress function from which plane stress systems in any homogeneous aeolotropic material that satisfies Hooke's law can be derived. The condition that the equation gives physically possible solutions in certain types of problems is also stated. Problems dealt with are those in which an isolated force acts at a point in the straight boundary of a semi-infinite plate, and stress distributions in an infinite plate with a circular hole. It is shown that Sen's method [Abstr. 2318 (1939)] may be extended to apply to the kind of material mentioned. G. E. A.

See Abstr. 2514 531.51 : 530.12

See Abstr. 2627 531.7 : 548.0 = 3

2517 531.724 : 539.217 : 541.183.03

The low-temperature adsorption of nitrogen, oxygen, argon, hydrogen, *n*-butane and carbon dioxide on porous glass and on partially dehydrated chabazite. EMMETT, P. H., AND DEWITT, T. W. *J. Amer. Chem. Soc.*, 65, *pp.* 1253–1262, *July*, 1943.—The surface area of porous glass can be measured by the low-temp. gas adsorption method; chabazite, when only 50% dehydrated, adsorbs no N at − 195° but will adsorb considerable H at − 195° and CO_2 at − 78°. The occurrence of reproducible hysteresis loops in the adsorption–desorption curves on porous glass is discussed. The average pore size of the porous glass is calculated. The largest pores were about 60 Å in radius.

2518 531.732

Results of tests on volumeters for liquid hydrocarbons. PIGOTT, R. J. S., AMBROSIUS, E. E., AND JACOBSON, E. W. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 350–352, *May*, 1943.—Tests made with 22 representative displacement meters of the film-sealed and pack-sealed types show that such volumeters are subject to viscosity and temperature effects when used to measure heavy, light and medium oils and gasoline. If an accuracy within 0·1% is desired, suitable calibration equipment is necessary, and the meters must be tested at the viscosity and temperature and throughout the flow range at which they are to be operated. J. S. G. T.

2519 531.754.6 : 677 = 3

A new physical method for the quantitative analysis of fibres in mixed textiles. FEHLMANN, H. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 109–112, *April*, 1943.—The floatation method of analysis described is based on density variations of fibres with resp. to chloroform. The sample of mixed textile must be finely divided (0·1 to 0·5 mm.), dried, or its moisture standardized, and a weighed amount placed in an analytical tube (designed by the author) together with pure chloroform. The tube is stoppered and the behaviour of the textile noted. If necessary to promote a separation of the different fibres, the chloroform can be made heavier or lighter by introduction of a suitable solvent. The fibres are thus separated according to their densities, some float, others sink, and the fractions are removed, dried and weighed. Full manipulative details are included. H. H. HO.

2520 532.13

Measurement of anomalous viscosity by the capillary-tube method. MERRINGTON, A. C. *Nature, Lond.*, 152, *pp.* 214–215, *Aug.* 21, 1943.

2521 532.133

Three types of energy of viscosity. DUNSTAN, A. E., AND NISSAN, A. H. *Phil. Mag.*, 34, *pp.* 479–486, *July*, 1943.—Three terms of energies determine the value of the viscosity of simple liquids. The first value appears to be invariant. The two other terms both increase rapidly but at different rates with temperature, are of opposite sign and cancel out at the critical temperature. A tentative explanation is offered. Similar results are suggested with lat. ht. of vaporization. It appears that there is an inherent increase in the viscosity of liquids when the temperature is raised, masked by a larger decrease. H. H. HO.

2522 532.133

The viscosity function. IV. Non-ideal systems. IRANY, E. P. *J. Amer. Chem. Soc.*, 65, *pp.* 1392–1398, *July*, 1943.—Analysis of viscosity data by the functional scales [Abstr. 35 (1943)] continues to prove its reliability. The system H_2SO_4–ether, the aq. and formamide mixtures of dioxane, the lower alcohols and fatty acids are discussed as examples. The method not only yields more plausible and concordant results than otherwise are obtainable but it reveals distinctions which, in the commonly adopted practices of evaluation, are entirely lost.

See Abstr. 2525 532.133 : 541.265 : 532.612.4

2523 532.525 : 533.6

Developments in the measuring of pulsating flows with inferential-head meters. BEITLER, S. R., LINDAHL, E. J., AND MCNICHOLS, H. B. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 353–356, *May*, 1943.—A piezo-electric device and a mechanical pulsometer for measuring pulsation waves in orifice meters inserted

in pulsating flows of air and natural gas and in pressure devices connected therewith are described. Indicating devices under such conditions are known to be erratic, and preliminary work shows that it is not practicable to predict their percentage error, except when the error is < about 1 or 2%. J. S. G. T.

2524 532.57

Liquid flow at small constant rates. KING, R. O., AND DAVIDSON, R. R. *Canad. J. Res.*, 21, *pp.* 65–67, *July*, 1943.—Gas is liberated from the electrolyte in a small cell at a rate $\propto$ the current passing through it. The cell is connected to a vessel containing the liquid to be metered and when temperature and pressure become steady, liquid is discharged through an outlet from the vessel at a rate $\propto$ to the electric current through the cell.

2525 532.612.4 : 532.133 : 541.265

Molecular surface energy of sulphur dioxide addition compounds. II. BRIGHT, J. R., AND JASPER, J. J. *J. Amer. Chem. Soc.*, 65, *pp.* 1262–1263, *July*, 1943.—[See Abstr. 1502 (1942)]. The effect of temperature on the molecular surface energy of $(C_2H_5)_3N \cdot SO_2$ was determined. Data are presented for density, surface tension and viscosity from 0 to 30°. Parachor data furnish evidence for the existence of a (N–O–S) linkage.

2526 532.613 : 669.715 : 621.791.3

Soldering aluminium alloys. *Iron Age*, *pp.* 52–57, *May* 27, 1943.—[Abstr. 2301 B (1943)].

2527 532.613.4

Note on Antonoff's rule. YOFFE, A., AND HEYMANN, E. *J. Phys. Chem.*, 47, *pp.* 409–410, *May*, 1943.—[See Abstr. 2825 (1942)].

2528 532.7

The properties of fluids. BRADFORD, S. C. *Phil. Mag.*, 34, *pp.* 433–471, *July*, 1943.—Maxwell's kinetic theory is extended [see Abstr. 54 (1938)] to the properties of associated liquids. The lat. ht., v.p. and viscosity of associated liquids are determined by Newtonian dynamics. The method is applied to the thermal conductivity and viscosity of gases. The resulting formulae give values accurate to 2 significant figures. H. H. HO.

2529 532.712

The activity and osmotic coefficients of sodium chlorate by an isopiestic method. JONES, J. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1353–1354, *July*, 1943.—The isopiestic ratios of NaCl-$NaClO_3$ were determined over the approx. concentration range 0·2 to 3·5 molal. From the observed molalities and ratios, the activity and osmotic coefficients were determined by comparison with NaCl.

2530 532.72 : 551.573

On the equation of diffusion in a turbulent medium. SUTTON, W. G. L. *Proc. Roy. Soc. A*, 182, *pp.* 48–75, *Sept.*, 1943.—The 2-dimensional form of the equation of diffusion, $u\partial\chi/\partial x = \partial\{A_z\partial\chi/\partial z\}/\partial z (z > 0)$, under steady mean conditions in a fluid moving with mean vel. u is discussed, where u and A_z vary as z^m and z^{1-m} respectively $(0 < m < 1)$. Integrals are constructed which satisfy boundary conditions of the types arising in physical problems, and the results are applied to the theory of evaporation into a turbulent atmosphere.

2531 532.72 : 551.573

Evaporation from a plane, free-liquid surface into a turbulent air stream. PASQUILL, F. *Proc. Roy. Soc. A*, 182, *pp.* 75–95, *Sept.*, 1943.—Sutton's theory [Abstr. 4480 (1934)] assumes that the turbulent transfer of any entity is determined by the momentum interchange coeff., which involves the kinematic viscosity of the diffusing medium, and which leads to a functional form for evaporation which agrees with exp. data. Developed into a computable form, and tested against present experiments on bromobenzene and against experiments by Éliás [Abstr., 2586 (1930)], the theory predicts the abs. rate of turbulent transfer. An extension to rel. rates of evaporation of various liquids shows that the theory specifies inadequately the variation of rate of evaporation with type of liquid. An empirical generalization of Sutton's theory is set forth, in which the turbulent interchange coeff. is modified by the molecular diffusion coeff. appropriate to the entity undergoing transfer.

See Abstr. 2547 532.77 : 535.324 = 3

2532 533.16

The dynamic viscosity of nitrogen. SIBBITT, W. L., HAWKINS, G. A., AND SOLBERG, H. L. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 401–405, *July*, 1943.—A Ni capillary 118 ft. long was used in the investigation. Data are reported of 45 calibration tests and 395 tests on Ni up to 1 020 lb./in.^{2} and 923°F. An equation is presented which expresses the test results.

See Abstr. 2523 533.6 : 532.525

SOUND. VIBRATIONS

See Abstr. 2589 534.13 : 539.32

2533 534.13.013 : 621.396.611.1

Electrical-circuit analysis of torsional oscillations. PIPES, L. A. *J. Appl. Phys.*, 14, *pp.* 352–362, *July*, 1943.—[Abstr. 2264 B (1943)].

2534 534.14 = 3

On some experiments with sound waves generated by periodical suction impulses. BRUNS, F. *Akust. Z.*, 7, *pp.* 29–32; *Jan.*, 1942.—A box containing lycopodium, iron or eosin powder, or fine wheat flour, was placed on top of a vertical Kundt's tube and the behaviour of the substances when subjected to periodical suctional impulses of increasing strength is described. The influence of a magnetic field applied to the iron powder is also described. R. N.

2535 534.143 = 3

Vibrating table for dynamic testing in the sound-frequency range. MEISTER, F. I. *Akust. Z.*, 7, *pp.* 51–56, *March*, 1942.—A vibrating table for a std. range of 5 to 1 000 c./s. (pure sine waves) is described. The table consists of a light metal cage fixed on a metal membrane and acted upon by 1 or 2 coils fed by current of variable frequency and specially stiffened to withstand deformations. If only one coil is used for generating the vibrations the other may be used for measuring the frequency. R. N.

2536 534.15 = 3

The plotting of rapidly varying phenomena with Neumann's damping-recorder. GOSEWINKEL, M. *Akust. Z.*, 7, *pp.* 104–111, *May*, 1942.—The limits of applicability of Neumann's logarithmic recording system [Abstr. 2503 B (1935)] are discussed. Pheno-

mena are recorded accurately only if their rate of change is less than the recording speed of the instrument. Not the duration but the steepness of an impulse determines the correctness of the record. The suitability of the recorder for measurements of reverberation effects and of sound intensity is discussed. R. N.

2537 534.22.094.1 : 534.321.9 = 3

On the propagation of ultrasonic waves in wires. CZERLINSKY, E. *Akust. Z.*, 7, *pp.* 12–17, *Jan.*, 1942.—Dispersion curves are calculated, the investigations being based on previous work of Love. The curves show the relation betw. speed of propagation and frequency or wavelength. Damping caused by internal friction and by radiation, and the influence of heat conduction, are neglected. In that range of frequency where the wavelength and the wire dia. are of the same order of magnitude, the speed of propagation decreases with increasing frequency. For higher frequencies the sound velocity becomes independent of frequency. Measurements on 15 cylinders of different materials and diameters agree with the calculations. R. N.

2538 534.321.33

The problem of the keyboard instrument. LLOYD, L. S. *Phil. Mag.*, 34, *pp.* 472–479, *July*, 1943.—The inadequacy of the cycle of fixed tones corresponding to frequencies in the proportions 1, $\frac{9}{8}$, $\frac{5}{4}$, $\frac{4}{3}$, $\frac{3}{2}$, $\frac{5}{3}$, $\frac{15}{8}$, 2 as a musical scale, is now held to be independent of modulation, and it is shown to be due to inherent defects in the structure of the cycle. Mean-tone temperament is given full description and contrasted with equal temperament. H. H. HO.

See Abstr. 2537 534.321.9 : 534.22.094.1

2539 534.321.9 : 620.19 : 669

Metallurgical possibilities of ultrasonic waves. *Mech. World*, 113, *pp.* 191–192, *Feb.* 19, 1943.—Properties of ultrasonic waves are discussed with sp. ref. to phenomena caused by defects in metals and possibilities of using ultrasonic waves in metallurgy. E. R. A.

2540 534.512 = 3

On superposition of undamped plane gas waves of large amplitude. PFRIEM, H. *Akust. Z.*, 7, *pp.* 56–65, *March*, 1942.—The simultaneous, non-linear differential equations characterizing the wave form in the range of superposition of 2 plane gas waves moving in opposite directions are derived. Using Riemann's method, these are reduced to a second-order linear differential equation, the solution of which may be found for perfect gases. After passing the range of superposition, the 2 pressure waves have the same waveform as if propagated in space without mutual interference, but distortions within the range of superposition influence the resultant field. R. N.

2541 534.756 : 612.85 = 3

The mass ratio between membrane and liquid of the internal ear. RANKE, O. F. *Akust. Z.*, 7, *pp.* 1–11, *Jan.*, 1942.—By means of a simplified model the equilibrium conditions betw. pressure of the liquid and impedance of the membrane are investigated. Phase angle and value of impedance are represented by transcendental equations which are analysed graphically. The ratio betw. the masses of membrane and liquid is determined and its influence on the time of response and damping of the acoustical sensation is discussed. R. N.

2542 534.832 = 3

Noise suppression in fine-mechanical gear. BERGER, R. *Akust. Z.*, 7, *pp.* 18–29, *Jan.*, 1942.—The principles of noise suppression are discussed and a great number of examples are given for showing how these principles are put into service for suppressing the noise of telephones, radio receivers, typewriters, sewing machines, vacuum cleaners, alarm clocks and the like. Protecting covers, special designs of ratchet gears, replacement of striking by pressing movements, are some of the means for accomplishing the noise suppression. R. N.

2543 534.84 = 3

Remarks on "Oelsner's building method." HOFBAUER, G. *Akust. Z.*, 7, *pp.* 111–115, *May*, 1942.—Critical remarks on the method which consists in introducing non-rigid members in the joints of reinforced-concrete buildings and claims to suppress undesirable acoustic effects and reverberation by changing oscillatory energy into energy of plastic deformation. R. N.

2544 534.845 = 3

Theory of sound damming by thin walls. CREMER, L. *Akust. Z.*, 7, *pp.* 81–104, *May*, 1942.—The damming for perpendicular incidence is calculated and compared with the result of measurements obtained with statistical distribution of angles of incidence. Mass and frequency are the main factors. The movement of the wall is considered as a forced bending oscillation. When the component of sound velocity along the surface of the wall = the speed of propagation of a free oscillation of the membrane, the pressure diff. = 0. This "coincidence effect" and its dependence on frequency is investigated and the analogies between coincidence and resonance are discussed. R. N,

OPTICS

2545 535.13

New exact solution in non-linear optics (two-wave system). SCHRÖDINGER, E. *Proc. Roy. Irish Acad.*, 49*A*, 4, *pp.* 59–66, *June*, 1943.—An exact solution of the problem of the mutual influence of 2 plane waves is given [see Abstr. 1042 (1943)]. A. J. M.

2546 535.318

An empirical approach to lens designs. The Huygens eyepiece. STEMPEL, W. M. *J. Opt. Soc. Amer.*, 33, *pp.* 278–292, *May*, 1943.—Empirical methods which shorten the preliminary calculations are applied to the Huygens eyepiece. The methods of calculating the empirical data are described and the results are applied to give curves from which the various parameters of the required eyepiece are determined. A. W.

2547 535.324 : 532.77 = 3

Refractometric properties of aqueous solutions of mixtures of electrolytes. SPACU, G., MARGULESCU, I. G., AND POPPER, E. *Z. phys. Chem. B*, 52, *pp.* 117–126, *July*, 1942.—A method is derived for calculating the refractive index of solutions of mixed electrolytes if chemical reactions are excluded. By comparing this with the refr. index of pure electrolytes, conclusions may be drawn on the nature and composition of complex ions. R. N.

2548 535.338.42-31

The ultra-violet spectra and electron configuration of HgF and related halide molecules. HOWELL, H. G. *Proc. Roy. Soc. A*, 182, *pp.* 95–112, *Sept.*, 1943.—The high-frequency ultra-violet emission spectrum of HgF was photographed and analysed into 2 systems which are due to a $^2\Pi_r$–$^2\Sigma$ transition between Hg atom-like levels. Corresponding systems of the Zn and Cd halides should exist with doublet separations similarly related to the atomic ^3P level. Most of these have been identified amongst existing data. A system of CdI different in type from those above is analysed. A probable $^2\Sigma$–$^2\Sigma$ system overlapping the main $^2\Pi$–$^2\Sigma$ system is found for most of the molecules.

2549 535.343-1

Infra-red absorption of pyridine vapour. TURKEVICH, J., AND STEVENSON, P. C. *J. Chem. Phys.*, 11, *pp.* 328–329, *July*, 1943.—The determination of the spectrum was carried out on a carefully purified sample of pyridine in the vapour state.

See Abstr. 2615 535.371 : 541.144.7

2550 535.375.5

Raman spectra of hydrocarbons. III. Di-isobutylene, cyclohexene and dipentene. CLEVELAND, F. F. *J. Chem. Phys.*, 11, *pp.* 301–306, *July*, 1943.—Raman frequencies, rel. intensities and depolarization factors are listed for di-isobutylene, cyclohexene and dipentene. The compounds contain the groups XYC=CH_2, XHC=CHX (*cis*), and XYC=CHZ. The first of these has nearly the same olefinic frequencies as 2-methyl-1-heptene [Abstr. 2174 (1943)], except that the 1 414 cm.$^{-1}$ frequency of the latter has dropped to 1 376. The last two groups were contained in structures of cyclohexene and dipentene and had nearly the same frequencies.

2551 535.375.5

The aldol condensation. I. Detection of carbonyl groups in aldols by use of Raman spectra. SAUNDERS, R. H., MURRAY, M. J., CLEVELAND, F. F., AND KOMAREWSKY, V. I. *J. Amer. Chem. Soc.*, 65, *pp.* 1309–1311, *July*, 1943.

2552 535.434 : 541.182.5

Opacity changes in gel-forming mixtures during setting. I. Thorium molybdate, stannic arsenate and silicic acid gels. PRASAD, M., AND GOGATE, V. S. *Proc. Indian Acad. Sci. A*, 17, *pp.* 161–170, *May*, 1943.—The opacity changes were investigated by an improved apparatus. The effects of the addition of different amounts of the gel-forming constituents, HCl and non-electrolytes, on the gels, are discussed. Changes in the number, size, distribution, arrangement etc., of the micelles of the gel, contribute to the changes in opacity.

2553 535.642

Representation of intensity, hue, saturation and the magnitude of the resultant vector on the trichromatic theory. PEDDIE, W. *Phil. Mag.*, 34, *pp.* 488–495, *July*, 1943.—Points out the fundamental importance of the "Law of Coefficients" which states that the value of a stimulus is expressed by the number of just perceptible steps in it and is independent of the actual magnitude of the threshold of perceptible stimulus. The law is combined with the law of colour mixture and reconciles this with Helmholtz's colour-vector law.

J. W. T. W.

2554 535.653.33 : 591.111.2

A simple inexpensive photo-electric haemoglobinometer. BELL, G. H., AND GUTHMANN, E. *J. Sci. Instrum.*, 20, *pp.* 145–146, *Sept.*, 1943.—A colorimeter is described which is unaffected by variations in the light source or photocell characteristics, and for which the density or extinction E scale can be obtained by simple calculation. With the lamp at the max. distance D_0 from the photocell and with water only in the glass cell, the galvanometer deflection is noted; blood is added to the water in the glass cell and the lamp is pushed up to a distance D_1 from the photocell where the photocell current is the same as before. Then $E = \log D_0^2/D_1^2$.

2555 535.733.1

Effectiveness of vitamin A in the treatment of defective colour vision. ELDER, J. H. *Science*, 97, *pp.* 561–562, *June* 18, 1943.

2556 535.755

Colour blindness and the detection of camouflage. JUDD, D. B. *Science*, 97, *pp.* 544–546, *June* 18, 1943.—Examines the possibility that a colour-blind observer may be able to detect camouflage better than a normal-sighted observer, and concludes that certain types of camouflage may be more readily detectable by a red-green-blind observer. The artificial conversion of a normal to a colour-blind observer by means of a colour filter is not considered feasible.

J. W. T. W.

2557 535.81

Recent optical materials and their possible applications. JOHNSON, B. K. *Proc. Phys. Soc., Lond.*, 55, *pp.* 291–300, *July*, 1943.—Deals with developments during 1933–43. Optical glasses have been introduced providing a greater range of refr. index and dispersion, and there has been a tendency towards making glass transparent to ultra-violet rays. Transparent synthetic resin plastics have been developed, e.g. Perspex, Polystyrene, with possibilities in the production of achromatized lenses. Fused quartz has been used for this purpose in combination with LiF. With the development of a new commercial technique for the production of artificial alkali-halide crystals of large dimensions, spectroscopic work in the ultra-violet and infra-red may be greatly extended. Large crystals of $NaNO_3$ may be grown artificially. These crystals are bi-refracting and resemble calcite in optical properties.

A. E. T.

2558 535.81 : 679.5

Plastics and the optical industry. WEARMOUTH, W. G. *Proc. Phys. Soc., Lond.*, 55, *pp.* 301–313, *July*, 1943.—A general survey of the main transparent plastics, which may be considered as possible substitutes for optical glasses, viz. cellulose derivatives, urea-formaldehyde and phenol formaldehyde resins, and polymerization products. The properties of these materials compared with those of optical glass are given in a table. Dispersion curves are shown, and the possibility of producing achromatic lenses and optical filters from plastics is considered.

A. E. T.

2559 535.83 : 679.5

Plastic spectacle lenses. EMSLEY, H. H. *Proc. Phys. Soc., Lond.*, 55, *pp.* 314–321, *July*, 1943.—Perspex, a polymer of methyl methacrylate, possesses all the qualities desirable in a material for spectacle

nses, except that it is rather soft and scratches readily. Tests reveal that the effect of scratches on the wearer's vision and comfort is less than expected. The superiority of Perspex with respect to resistance to impact and splintering is shown. A brief account is given of the manufacture of Perspex spectacle lenses, and reference is made to the use of polystyrene for other types of lenses. A. E. T.

HEAT. THERMODYNAMICS

2560 536.242 : 621.186

Tests of steam-pipe insulation. Allcut, E. A. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 407–419, *July*, 1943.—The properties of spun rock wool, glass wool and corrugated asbestos were examined with regard to the effects of density, binder and thickness. The influence of wind, the protection of the outer surface of the insulation by metallic coverings and the protection of fabric coverings by paints were investigated. Even bright metals (Cu, Al) made but slight difference in the heat losses, and most paints increased the losses.

2561 536.4 : 541.132.3 : 547.962.3

The influence of heat treatment on solutions of crystalline horse serum albumin. Cooper, G. R., and Neurath, H. *J. Phys. Chem.*, 47, *pp.* 383–398, *May*, 1943.—Investigation of the effects of heat on solutions of crystalline horse serum albumin, using the methods of diffusion, viscosity and electrophoresis, revealed a dependence of the nature and magnitude of the changes in the protein molecule on the *p*H of the solutions and on their ionic strength. At *p*H 7·6 the heat-treated solutions differed from those of the native protein in average particle size and shape, in electrophoretic mobility and pattern, and in their susceptibility to tryptic digestion. At *p*H 3·6 the unheated and heated proteins did not differ from each other in average molecular size or shape. At *p*H 4·2 the unheated protein had about the same mol. wt. as at *p*H 5·0. Heating produced a large degree of polymerization.

2562 536.423 = 3

Kinetics of the evaporation of ammonium-chloride. Spingler, H. *Z. phys. Chem. B*, 52, *pp.* 90–116, *July*, 1942.—The rate of evaporation and its dependence on temperature was investigated by theory and experiment. With balanced v.p., evaporation takes place from a layer of highly movable and loosely bound NH_3 and HCl molecules of high conc.; the rate of evaporation in vacuo is determined by the slow transition of pairs of NH_4Cl ions from the crystal lattice to the surface. R. N.

2563 536.462

Temperature of flame gases. David, W. T. *Nature, Lond.*, 151, *p.* 278, *Sept.* 4, 1943.

2564 536.463

Temperature, pressure and specific-volume changes of a gas under dissociation and re-association conditions. Walker, W. J. *Phil. Mag.*, 34, *pp.* 486–488, *July*, 1943.—A direct computation method is given for arriving at the temperature and pressure of explosion of a mixture of fuel and air, taking dissociation into account. The method applies also to the re-association correction required for temperature, pressure and sp. vol. changes during subsequent expansion. The same method of computation can be applied to the combustion of rich and weak mixtures. H. H. Ho.

2565 536.468 : 691 : 614.84

Method of fire-hazard classification of building materials. Steiner, A. J. *Bull. Amer. Soc. Test. Mater.*, *pp.* 19–22, *March*, 1943.—[Abstr. 2158 B (1943)].

2566 536.52 : 621.316.74 : 621.383 : 621.317.39

Temperature measurement and control with solid photo-electric cells. Fogle, M. E. *Trans. Electrochem. Soc.*, 83, *Prepr. No.* 14, 1943.—[Abstr. 2224 B (1943)].

2567 536.63 : 536.7

The specific heats at low temperatures of anhydrous chlorides of calcium, iron, magnesium and manganese. Kelley, K. K., and Moore, G. E. *J. Amer. Chem. Soc.*, 65, *pp.* 1264–1267, *July*, 1943.—Sp. ht. data in the range 51°–289°K. are reported for $CaCl_2$, $FeCl_2$, $MgCl_2$ and $MnCl_2$ in the anhydrous crystalline state. Values of entropy and free energy of formation are computed.

See Abstr. 2601 536.653 : 541.123.2.034.6

See Abstr. 2567 536.7 : 536.63

ELECTRICITY. MAGNETISM

See Abstr. 2596 537.226.3 : 539.433 : 621.315.611.011.5 : 539.62

2568 537.362

The construction of Tiselius electrophoresis cells. Wright, G. G., and Swingle, S. M. *Science*, 97, *p.* 564, *June* 18, 1943.

2569 537.533.72 = 3

The effect of a phase-focusing of higher order on the Fourier components of the ray-current density. Borgnis, F., and Ledinegg, E. *Z. techn. Phys.*, 12, 23, *pp.* 306–312, 1942. *Abstr. in Wireless Engr*, 20, *p.* 395, *Aug.*, 1943.—The paper shows for a particular example—the use of a single lens modulated by a fundamental and its first harmonic—that the Fourier amplitudes of the current density actually are higher than those given by a lens modulated only by the fundamental, and investigates what time-characteristic of the velocity modulation at the modulating lens will yield the max. possible Fourier amplitudes.

2570 537.533.8

The secondary electron emission from metals in the low-primary-energy region. Gimpel, I., and Richardson, O. *Proc. Roy. Soc. A*, 182, *pp.* 17–47, *Sept.*, 1943.—A beam of primary electrons is controlled by an electrostatic lens system, which directs it towards the centre of a sphere *A* of the material investigated. *A* is surrounded by a concentric conducting sphere which collects the secondary electrons emitted. The method is applied to pure gas-free Cu with primary electrons having energies down to the lowest practicable with a W thermionic source. The distribution of energy is found to be the same for both primary and secondary electrons for all energies below a few volts; the secondary electrons are just reflected electrons, and the coeff. of reflection varies little with the energy. No manipulation with fields can ever reduce the mean energy of electrons from a thermionic source

below $2kT$, where T is the temperature of the source and k is Boltzmann's constant.

2571 537.56

The low-velocity scattering of H^+ and H_3^+ in hydrogen. SIMONS, J. H., FONTANA, C. M., MUSCHLITZ, E. E., JR., AND JACKSON, S. R. *J. Chem. Phys.*, 11, *pp.* 307–312, *July*, 1943.—The theory of elastic scattering is examined. Precise measurements are reported on the scattering of H^+ and H_3^+ in H in the range 2–135 V. [Abstr. 709 (1943)]. The exponential form of a potential law changes with the velocity of the ion.

2572 537.56

The low-velocity scattering of H_2^+ in hydrogen. The determination of neutralization. SIMONS, J. H., FONTANA, C. M., FRANCIS, H. T., AND UNGER, L. G. *J. Chem. Phys.*, 11, *pp.* 312–316, *July*, 1943.—Measurements of the effective cross-sectional area for neutralization were made for H_2^+ in hydrogen over a range of 4–30 V. The technique of the method of measurement is discussed and possible experimental uses for it are suggested.

2573 537.56

The scattering of low-velocity hydrogen ions in water vapour. SIMONS, J. H., FRANCIS, H. T., MUSCHLITZ, E. E., JR., AND FRYBURG, G. C. *J. Chem. Phys.*, 11, *pp.* 316–321, *July*, 1943.—The elastic scattering of H^+, H_2^+ and H_3^+ in water vapour was measured in the range 2–130 V. Assuming an equilibrium distance of 1·013 Å, the proton affinity of H_2O is calculated to be 6·5 eV. A design is given of a Knudsen gauge for the measurement of water vapour. A new technique (electric discharge in oxygen) is described for the removal of insulating films on the metallic surfaces. These films are apparently carbonaceous and formed by the action of the ion beam on traces of organic compounds in the vapour.

2574 537.56

The scattering of low-velocity hydrogen ions in helium. SIMONS, J. H., MUSCHLITZ, E. E., JR., AND UNGER, L. G. *J. Chem. Phys.*, 11, *pp.* 322–328, *July*, 1943.—The l.v. scattering of H^+, H_2^+ and H_3^+ in He was measured. No neutralization was experienced and the potential laws were evaluated. The interaction of H_3^+ in He shows the effect of the chemical combination to form HeH^+. Assuming an equilibrium distance of 0·8 Å, the interaction energy is 3·27 eV. H_2^+ in He follows the law expected on the basis of the interaction of the charge on an ion with a polarizable molecule. The interaction of H_3^+ with He is more complex.

2575 537.568

Recombination law for weak ionization. NOLAN, P. J. *Proc. Roy. Irish Acad.*, 49*A*, 5, *pp.* 67–90, *June*, 1943.—The recombination law, $dn/dt = -\alpha n^2$, has been investigated in the case of weak ionization (1 500–12 000 ions per cm.^{3}), the ionic concentration being measured by the application of a high field. When dn/dt is determined from the rate of growth of ions, the above law holds, but values obtained from saturation currents are greater than those required by the law. The application of the results to atmospheric ionization is considered. The value of α obtained is $1·41 \times 10^{-6}$ cm.^{3} per sec., independent of concentration and time measured from the attainment of random distribution. A. J. M.

2576 538.561

On the theory of the mass radiator. GLAGOLEVA-ARKADIEVA, A. A. *C.R. (Doklady) Acad. Sci. U.R.S.S.*, 32, *pp.* 540–542, *Sept.*, 1941. *Abstr. in Wireless Engr.*, 20, *p.* 394, *Aug.*, 1943.—This source of radiation consists of a mixture of movable metal particles suspended in a liquid dielectric medium. To this mixture, named the vibrational mass, is conducted high voltage from an inductor. Sparking between the particles gives rise to electrical vibrations in these particles. The frequencies of the vibrations extend far into the region of the infra-red spectrum.

2577 538.566 : 621.396.11 = 3

On the propagation of ultra-short waves along a dielectric conductor. SLEVOGT, K. E. *Hochfrequenztechn. u. Elektroakust.*, 59, *pp.* 1–10, *Jan.*, 1942.—[Abstr. 2259 B (1943)].

2578 538.566.2 : 621.396.11$_o$ = 3

On the propagation of electromagnetic waves in a magnetized medium at perpendicular incidence. FÖRSTERLING, K. *Hochfrequenztechn. u. Elektroakust.*, 59, *pp.* 10–22, *Jan.*, 1942.—[Abstr. 2260 B (1943)].

2579 538.7 : 527(09)

Some early contributions to the history of geomagnetism. II–III. HARRADON, H. D. *Terr. Magn. Atmos. Elect.*, 48, *pp.* 79–91, *June*, 1943.—[See Abstr. 1982 (1943)].

MOLECULAR AND ATOMIC PHYSICS

2580 539.152.1

On the theory of a mixed pseudoscalar and a vector meson field. PAULI, W., AND KUSAKA, S. *Phys. Rev.*, 63, *pp.* 400–416, *June* 1 *and* 15, 1943.—The mixed-meson theory in the strong-coupling approximation is investigated. The work differs from that of Serber and Dancoff [Abstr. 1986 (1943)] in that the nucleons are not considered to be at rest. The results do not agree with experiment, giving a magnetic moment for the deuteron which is only a small fraction of the observed value, and predicting instability of highly charged nuclei, difficulties which do not occur in the weak-coupling theory. A. J. M.

2581 539.162

Radioactivity and the completion of the periodic system. PONISOVSKY, L. *Nature, Lond.*, 152, *pp.* 187–188, *Aug.* 14, 1943.

2582 539.211 : 621.385.833

Interpretation of electron micrographs of silica surface replicas. HEIDENREICH, R. D. *J. Appl. Phys.*, 14, *pp.* 312–320, *July*, 1943.—Experiments are described for investigating the interpretation of polystyrene-silica surface replicas. It is demonstrated on a polished and etched stainless steel 18–8 specimen that the light microscope and electron microscope pictures are similar with corresponding regions easily recognized. The value of stereo-pictures in determining rel. surface elevations is demonstrated with a comparison of the topography as shown by the light microscope using oblique illumination. The resolution is discussed and a method of quantitatively determining the practical limiting resolution of

replicas is described. A shape limitation factor is defined and evaluated for both silica and Formvar replicas. [See Abstr. 1174 (1943)].

See Abstr. 2517 539.217 : 541.183.03 : 531.724

2583 539.23 : 539.62

Frictional properties of metallic films. SCHNURMANN, R., HUGHES, T. P., AND HEATON, J. L. *Nature, Lond.*, 152, *pp.* 247–248, *Aug.* 28, 1943.—[See Abstr. 1724 (1943)].

2584 539.24 : 621.385.833

Some applications of the high resolving power of the electron microscope. GREEN, H., AND FULLAM, E. F. *J. Appl. Phys.*, 14, *pp.* 332–340, *July*, 1943.—[Abstr. 2252 B (1943)].

2585 539.26 : 541.68

Intermolecular forces and chain configuration in linear polymers. The effect of *N*-methylation on the X-ray structures and properties of linear polyamides. BAKER, W. O., AND FULLER, C. S. *J. Amer. Chem. Soc.*, 65, *pp.* 1120–1130, *June*, 1943.—A series of 9 *N*-methylated polyamides, with methyl substitution varying in polydecamethylene sebacamide from 0–55 mole %, has been studied as a representative group of linear polymers showing physical properties ranging from hard brittleness to rubberiness. Young's mod., moisture sorption and rel. solubility were chosen for the gross solids, while the corresponding fine structure was studied by X-ray diffraction from oriented and unoriented sections. The elastic modulus and hardness decrease with increasing *N*-methylation; rel. solubility and moisture sorption increase. Inter-chain spacings are not changed, but the chains appear to be retracted by partial folding along the fibre axis. H. H. HO.

2586 539.264

Structure of α-keratin. MACARTHUR, I. *Nature, Lond.*, 152, *pp.* 38–41, *July* 10, 1943.—Improved X-ray technique (e.g. the use of precision collimators, vacuum cameras, long-distance photographs, monochromatic radiation and a rotating-target X-ray tube) has permitted a more detailed analysis of the α-structure. The new model put forward is based structurally on the close packing of side chains, and it is concluded that, along the fibre axis, there exists a main, regularly spaced grating of period 5·1 Å, with its planes regularly varying in reflecting intensity over a much longer period of 658 Å. The last figure may possibly be 198 Å, but the evidence is not conclusive. J. T.

2587 539.266

The structure of liquid mercury. CAMPBELL, J. A., AND HILDEBRAND, J. H. *J. Chem. Phys.*, 11, *pp.* 330–333, *July*, 1943.—The structure of liquid Hg was determined by diffraction of monochromatic Mo $K\alpha$ X-radiation at − 38°, 0°, 50°, 100°, 150° and 200°C. The position of the first peak remains const. at 3·00 Å but the number of atoms in this first co-ordination layer varies between 6·0 and 5·3, giving the lowest co-ordination number yet found for any monatomic element in its normal liquid range.

2588 539.266

The structure of liquid xenon. CAMPBELL, J. A., AND HILDEBRAND, J. H. *J. Chem. Phys.*, 11, *pp.* 334–337, *July*, 1943.—The structure of liquid xenon was investigated by diffraction of monochromatic Ag $K\alpha$ X-radiation, under the conditions: (1) Temp. − 110°C., pressure 1 atm., sp. vol. 0·324 cm.³/g.: (2) temp. − 90°C., pressure 2·5 atm., sp. vol. 0·339 cm.³/g.; (3) temp. − 90°C., pressure 130 atm., sp. vol. 0·324 cm.³/g. The number of nearest neighbours varies from 9 to 10 and their distance from the central atom from 4·43 Å to 4·50 Å. The structure is determined mainly by the sp. vol.

ELASTICITY. STRENGTH

2589 539.32 : 534.13 = 3

An acoustic method for determining the dynamic compressibility and the loss factor of elastic substances. MEYER, E., AND TAMM, K. *Akust. Z.*, 7, *pp.* 45–50, *March*, 1942.—The method consists in subjecting the substance to an oscillating pressure acting on it from all sides by enclosing it in a volume of water in which sound waves are generated. By measuring the resonance conditions with and without the test piece, the volumetric modulus of elasticity is determined, while the increase of the damping effect is a measure of the loss factor. The theory of the method is developed, the outfit described and illustrated, and results with wax, natural and synthetic rubber, and air, are given. R. N.

2590 539.374 : 621.774 : 621.186

The holding power and hydraulic tightness of expanded tube joints: analysis of the stress and deformation. GOODIER, J. N., AND SCHOESSOW, G. J. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 489–496, *July*, 1943.—[Abstr. 2173 B (1943)].

2591 539.374 : 621.774 : 621.186

Experimental investigation of tube expanding. GRIMISON, E. D., AND LEE, G. H. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 497–505, *July*, 1943.—[Abstr. 2174 B (1943)].

2592 539.385

On torsion combined with compression. BRIDGMAN, P. W. *J. Appl. Phys.*, 14, *pp.* 273–283, *June*, 1943.—If a bar is twisted while a longitudinal compressive load is applied, the bar may be twisted through much greater angles without fracture than is possible without the load. The specimen was the short central portion of a tube, and was separated from the ends by deep and narrow notches and contained a hard core. The two ends were fixed and the centre was twisted and a compressive load applied by a hydraulic ram. The speed of twisting was tested from a small value up to 40° per sec. The results were recorded photographically. Under compressional load, the curve shearing-stress/shearing-strain rises to a max. and then sinks with a long drawn-out tail. The remanent coherence is probably due to cold welding and the max. torque is not marked by any physical discontinuity. The mechanism of strain hardening appears to be different in torsion and in tension, and such a difference may be anticipated. The method of correlating tension and torsion by "octahedral" co-ordinates is not applicable to large strains. Certain large failures of isotropy are not covered by the conventional plasticity theory, and fracture in tension is different from fracture in shear. G. E. A.

See Abstr. 2596 539.433 : 537.226.3 : 621.315.611.011.5 : 539.62

2593 539.433 : 679.5

Behaviour of plastics under vibrations. LAZAN, B. J. *Mod. Plast.*, 20, *pp.* 83–88, 136, 138, 140, 142 *and* 144, *Nov.*, 1942.—Damping capacities and dynamic moduli of elasticity of materials under pure torsional and pure longitudinal vibrations are discussed and apparatus and technique described. E. R. A.

2594 539.501

On anomalies of elasticity and flow and their interpretation. SIMHA, R. *J. Phys. Chem.*, 47, *pp.* 348–363, *April*, 1943.—Elastic relaxation, elastic after-effect, and creep, characteristic for inorganic glasses and high polymers, are considered. The behaviour of such materials is characterized by the existence of a whole set or a distribution of mechanical relaxation frequencies. Similar conclusions have been reached on the basis of the dielectric dispersion of polar polymers. Three molecular mechanisms determine roughly the relaxation spectrum of a high polymer, the reaction of the chain segments to the applied stress, the change of shape of the chain as a whole, and the mutual interaction of chains. It is shown how the Boltzmann memory function and the spectrum may be obtained from creep data.

2595 539.62

Frictional phenomena. XIII. Internal friction in solids. GEMANT, A. *J. Appl. Phys.*, 14, *pp.* 204–216, *May*, 1943.—The internal friction is determined experimentally from the log. decrement (δ) of a vibrating body and the resonance curve under forced vibration; the "bluntness" of the curve is shown to be related to δ. The methods detailed are: Kimball's rotating rod deflected by a weight, free torsional vibration of a vertical shaft, resonant flexural vibrations of bars. In general the variation of δ with frequency is small, but δ increases with temperature, slowly at first, then rapidly, is usually const. at small amplitudes but increases at larger amplitudes; the higher the elastic modulus of a material, the lower its decrement. The possible mechanisms underlying internal friction and leading to losses are a thermal process and a consequence of the plastic flow of solids. G. E. A.

See Abstr. 2583 539.62 : 539.23

2596 539.62 : 539.433 : 537.226.3 : 621.315.611.011.5

Frictional phenomena. XIV. Technical applications of the internal friction of solids. GEMANT, A. *J. Appl. Phys.*, 14, *pp.* 258–270, *June*, 1943.—The applications discussed are: (1) crank-shaft vibrations and whirl; (2) metallurgical properties and log. decrement δ; (3) damping in rubber tyres; (4) dielectric losses in solid insulating material. (1) The natural frequencies of parts of an engine may be excited by oscillatory forces and torques, and may lead to resonance, fatigue or fracture. Various damping processes are used to consume the energy of vibration. The whirl of a rotating shaft is self-excited by the internal friction of the shaft material and increases when frequency of rotation is $>$ frequency of whirl. (2) In metals, δ may change with temperature, polymorphic transition, grain size and annealing, and in alloys with composition. The damping method may be used to determine flaws and for following up the ageing of metals. (3) Rubber tyres damp vibrations due to uneven road surface. A high modulus within the allowed range and a low decrement is attained by the addition of gas black to the rubber. (4) Mobility of dipoles in solids may be explained in terms of internal friction. In solids, steady-stage processes are controlled by the plastic resistance, but vibrations are controlled by internal friction corresp. to a much smaller equivalent viscosity. The max. loss occurs when the frequency coincides with the reciprocal of the relaxation time of the dipoles. G. E. A.

PHYSICAL CHEMISTRY

2597 541.123.2/.3 : 541.6 = 3

Investigations on the compounds of aromatic amines with lower aliphatic acids. ANGELESCU, E., AND GIUSCA, R. *Z. phys. Chem. A*, 191, *pp.* 145–163, *Aug.*, 1942.—In the homologous series of aliphatic acids a discontinuity betw. members with 2 and 3 C atoms is observed when they are compounded with aromatic amines. This discontinuity manifests itself in volume contraction, viscosity, refr. index, electric conductivity, solubility and the states of equilibrium of binary and ternary systems. The facts confirm the hypothesis that these compounds form a transition betw. heteropolar saltlike molecular compounds and compounds of a more homopolar character. R. N.

2598 541.123.2 : 669.14

The thermal diagram of the system iron-tin. EHRET, W. F., AND GURINSKY, D. H. *J. Amer. Chem. Soc.*, 65, *pp.* 1226–1230, *June*, 1943.—A new phase diagram has been set up for the system Fe-Sn. It gives definite temperature intervals of stability for the several intermetallic phases. Lattice constants are given for the five intermediate phases, namely, Fe_2Sn, Fe_3Sn_2, γ(NiAs structure), FeSn and $FeSn_2$. Each of these phases possesses hexagonal symmetry.

2599 541.123.2 : 669.71 = 3

Remarks on the system aluminium-zinc. TIEDEMANN, O. *Z. phys. Chem. A*, 191, *pp.* 133–144, *Aug.*, 1942.—Recent investigations [*Metallwirtschaft*, 20, pp. 383 and 501, 1941], confirm the existence and the boundary lines of metastable states in the binary system Al–Zn and the concomitant ageing phenomena [Abstr. 881 (1926)]. R. N.

2600 541.123.2.034.6

Ethanol-water system. GRISWOLD, J., HANEY, J. D., AND KLEIN, V. A. *Industr. Engng Chem.*, 35, *pp.* 701–704, *June*, 1943.—Vapour-liquid data on the ethanol-water system are extended to high pressures to make possible more intelligent control over certain industrial processes. *Y-X-P-T* curves are evaluated up to a temperature of 275°C. at saturation pressures. Critical temperatures and pressures of the system are obtained.

2601 541.123.2.034.6 : 536.653

Equilibrium still for miscible liquids. JONES, C. A., SCHOENBORN, E. M., AND COLBURN, A. P. *Industr. Engng Chem.*, 35, *pp.* 666–672, *June*, 1943.—Equilibrium data at 760 mm. pressure are presented for ethylene-dichloride–toluene and ethanol-water. Isothermal data at 50° and 60°C. are given for the latter system. Consistency of results is shown by the close agreement with Raoult's law. The activity coefficients and the van Laar constants show a negligible

change with temperature over the range 50° to 60°C. in agreement with predictions from available heat-of-solution data.

2602 541.123.31

The ternary system: dioxane-ethanol-water. SCHNEIDER, C. H., AND LYNCH, C. C. *J. Amer. Chem. Soc.*, 65, *pp.* 1063–1066, *June*, 1943.—Vapour-liquid equilibria for dioxane-water at 1 atm. are presented. The min. azeotrope of this system has a composition 48·5 mole % dioxane with a b.p. at 87·59°. Refr. index and density data for the analysis of dioxane-ethanol-water were obtained. Vapour-liquid equilibria data at 1 atm. for the ternary system are presented, which permit the estimation of a ternary min. azeotrope.

2603 541.123.59

Equilibria in a carbonaceous cation exchanger. WALTON, H. F. *J. Phys. Chem.*, 47, *pp.* 371–382, *May*, 1943.—A study was made of the partition of pairs of cations betw. water and the carbonaceous cation exchanger Zeo-Karb. The exchanges were reversible except for Na-Ca, where there was hysteresis. The law of mass action was nearly obeyed for Na-K, Na-Ca, and Ca-Ba, but for Na-H and Ca-H there was considerable deviation. The distributions of these ions could be explained by assuming the exchanger to consist of 2 or more solid acids of different dissociation const. Uptake of Ca increased greatly as the *p*H was raised and showed no sign of reaching saturation.

2604 541.124

A method of study of the kinetics of chemical reactions. OLMER, F. *J. Phys. Chem.*, 47, *pp.* 313–317, *April*, 1943.—The study of chemical reactions by a new method of linearly increasing temperature gives the following information: (*a*) the temperature of the start of each reaction; (*b*) the number and the composition of any intermediate compounds; (*c*) the temperature at which each secondary reaction begins; (*d*) the rel. speeds of partial reactions; (*e*) the temperature of a modification in the kinetics of the reactions. From the inspection of curves obtained by the method, it is possible to study the various chemical reactions which occur in an industrial process. [Abstr. 2425 (1942)].

2605 541.124

Criterion for the mechanism of the reaction between alkyl halides and hydroxylic solvents. III. Reactions of *n*-butyl bromide. BIRD, M. L., HUGHES, E. D., AND INGOLD, C. K. *J. Chem. Soc.*, *pp.* 255–261, *June*, 1943.—A treatment of one of the 6 methods developed, especially in rel. to solvolytic substitutions, for distinguishing betw. the bi- and uni-molecular mechanism of nucleophilic substitution. The method utilizes effects produced by changes of solvent and, in the form here concerned, it depends on effects arising in mixtures of reactive solvents. The substitution used in illustration is the solvolysis, including hydrolysis and alcoholysis, of alkyl halides in hydroxylic solvents. A single pair of consts. permits the calculation of both rates and product compositions for the solvolysis of *n*-butyl bromide, consistently with previous conclusions that these reactions are bimolecular. Calc. results agree with experiment.

N. M. B.

2606 541.124

The kinetics of aromatic halogenation. I. Bromination. ROBERTSON, P. W., MARE, P. B. D. DE LA, AND JOHNSTON, W. T. G. *J. Chem. Soc.*, *pp.* 276–279, *June*, 1943.—The bromination of acetanilide, aceto-*p*-toluidide, mesitylene, anisole, and *p*-tolyl methyl ether in acetic acid at room temperature shows in the conc. region *M*/40 third-order kinetics. This reaction, which has a low heat of activation, changes to a bimolecular reaction at lower conc., with a higher *E* value. Addition of water to the solvent favours a bimolecular change, and addition of chloroform and CCl_4 causes the initiation of chain reactions, with order > 3.

2607 541.124

The kinetics of aromatic halogenation. II. The chlorination of hydrocarbons. MARE, P. B. D. DE LA, AND ROBERTSON, P. W. *J. Chem. Soc.*, *pp.* 279–281, *June*, 1943.—The rates of chlorination of benzene and naphthalene, and the heats of activation, were measured in acetic acid solution.

2608 541.124

Reduction of ferric oxide by hydrogen. OLMER, F. *J. Phys. Chem.*, 47, *pp.* 317–325, *April*, 1943.—The reduction of Fe_2O_3 and that of magnetic oxide in pure H were studied at temperatures which were increased linearly with the time. The curves show that Fe_2O_3 is reduced to magnetic oxide below 325°C., and directly to metallic iron above this temperature. Magnetic oxide is reduced directly to metallic Fe.

2609 541.124

Effect of dielectrics and solvent upon the regeneration in acid solution of alkali-faded bromophenol blue. AMIS, E. S., AND PRICE, J. B. *J. Phys. Chem.*, 47, *pp.* 338–347, *April*, 1943.—[See Abstr. 1900 (1942)]. The regeneration reaction of alkali-faded bromophenol blue in acid solutions was studied at various ionic strengths in water at 25°, 35° and 45°C. The reaction was also studied in isocomposition and in isodielectric water–ethyl-alcohol and water–methyl-alcohol solvents over the same range of temperature and at an acid strength of 0·09 *N*. The plots of the logs of rate const. *v.* $\sqrt{\mu}$ indicate a change in the molecular dispersion of the faded dye with changing acidity. The variations from the electrostatic and collision theories are attributed to the formation of ROH_2^+ ions.

See Abstr. 2624 541.124 : 541.63

See Abstr. 2625 541.124 : 541.634

2610 541.127

The transmission coefficient in the theory of absolute reaction rates. HULBURT, H. M., AND HIRSCHFELDER, J. O. *J. Chem. Phys.*, 11, *pp.* 276–290, *June*, 1943.—The activated-complex theory of reaction rates is discussed critically. The transmission coefficients for a number of idealized energy surfaces are computed quantum-mechanically. Curvature of the reaction path may introduce activation energy in addition to that caused by constriction and elevation of the energy valley. Except at low temperatures, this additional activation energy is negligible. It may contribute to the separation of isotopes, where small differences in activation energy are important. For systems in thermal equilibrium at room temperatures

and above, the average quantum-mechanical transmission coefficient differs insignificantly from that calculated by classical mechanics.

2611 541.128 : 772.1

Photographic development as a catalysed heterogeneous reaction. JAMES, T. H. *J. Chem. Phys.*, 11, *pp.* 338–341, *July*, 1943.—Development is considered as a catalysed reaction which takes place at the interface betw. the Ag nuclei and the solid Ag halide crystal. Ag atoms formed at the interface may migrate along the Ag surface for some distance before they become incorporated into the Ag lattice. An explanation of filament formation is given on this basis.

2612 541.128.1 : 541.183.03

The effect of active nitrogen and of certain nitrogen compounds on catalytic properties of carbon. BENTE, P. F., AND WALTON, J. H. *J. Phys. Chem.*, 47, *pp.* 329–337, *April*, 1943.—Activated lactose C acquired a significant amount of N content by treatment with active N and with NH_3 and NO at high temperatures. Treatment with N or N_2O under similar conditions did not cause N fixation. The C treated with active N and with NO showed a decrease in catalytic activity. NH_3 treatment caused a promoted activity which could equal the activity of carbons prepared from organic N compounds. The promoting effect is not due to NH_3. Treatment with N_2O at high temp. caused promotion without significant fixation.

See Abstr. 2561 541.132.3 : 547.962.3 : 536.4

2613 541.132.3 : 591.111 = 3

On temperature dependence of hydrogen ion concentration in blood and other buffers. SKOTNICKÝ, J. *Z. phys. Chem. A*, 191, *pp.* 180–191, *Aug.*, 1942.—Theoretical considerations and experiments with human and animal blood show that dpH/dT is const. without individual and pathological fluctuations. A method based on potentiometric measurements is given for determining the dissociation const. of water and its neutral point at 25°C. R. N.

2614 541.133.08 : 621.317.332 = 3

A new absolute method for determining the h.f. conductivity of aqueous electrolytes. PRACHER, A. *Hochfrequenztechn. u. Elektroakust.*, 59, *pp.* 157–162, *June*, 1942.—[Abstr. 2217 B (1943)].

2615 541.144.7 : 535.371

Chlorophyll fluorescence and energy transfer in the diatom *Nitzschia closterium*. DUTTON, H. J., MANNING, W. M., AND DUGGAR, B. M. *J. Phys. Chem.*, 47, *pp.* 308–312, *April*, 1943.—The quantum yield of chlorophyll fluorescence in *Nitzschia closterium* was const. within large limits of experimental error, for exciting light of wavelength 6 000, 5 780, 4 700 or 4 358 Å. Light absorbed by yellow pigments in *Nitzschia* can therefore reappear as chlorophyll fluorescence. The carotenoid-sensitized photo-synthesis in *N. closterium* takes place principally through the transfer of absorbed energy from carotenoid to chlorophyll molecules with subsequent reactions the same as though chlorophyll molecules were the primary absorbers. In acetone extracts of *N. closterium* light absorbed by the yellow pigments did not contribute to chlorophyll fluorescence.

2616 541.144.7 = 3

Photochemical reactions between vinyl chloride and chlorine and bromine, respectively, leading to the formation of 1,1,2-trichloro-ethane and 1,2-dibromo-chloro-ethane, respectively. SCHMITZ, R., AND SCHUMACHER, H. J. *Z. phys. Chem. B*, 52, *pp.* 72–89, *July*, 1942.—With the method and apparatus previously described [Abstr. 1776 (1943)] the photochemical halogenation of vinyl chloride was investigated. Formulae for the reaction velocity, temperature coefficient, quantum yield, influence of light intensity, of the reacting substances, of pressure and of additional oxygen, are discussed, and schemes for the reaction mechanism are given corresp. to experimental results. R. N.

2617 541.18.025

Breakdown of thixotropic structure as function of time. WELTMANN, R. N. *J. Appl. Phys.*, 14, *pp.* 343–350, *July*, 1943.—Measurements of the thixotropic breakdown of structure with time of agitation were performed at different rates of shear on a number of pigment suspensions and on various oils in a rotational viscometer. The product of rate of breakdown and time of agitation at any rate of shear is const. for each material. The equilibrium time—the time necessary to break the thixotropic structure down to its minimum at a specified rate of shear—is also independent of the rate of shear applied while agitating.

See Abstr. 2552 541.182.5 : 535.434

2618 541.182.6.05

The mechanism of the formation of Kohlschütter's silver sol. II. WEISER, H. B., AND ROY, M. F. *J. Phys. Chem.*, 47, *pp.* 325–329, *April*, 1943.—Stable, pure hydrosols of Ag of uniform particle size are obtained by the reduction of ultra-filtered solutions of Ag_2O with CO. The silver hydrosols formed under these conditions are purer and more uniform than the sols prepared by reduction with H. [See Abstr. 418 (1934)].

See Abstr. 2517 541.183.03 : 539.217 : 531.724

See Abstr. 2612 541.183.03 : 541.128.1

2619 541.183.24

Cation and anion interchange with zinc montmorillonite clays. ELGABALY, M. M., AND JENNY, H. *J. Phys. Chem.*, 47, *pp.* 399–408, *May*, 1943.—Cation and anion adsorption was studied for Na bentonite + $ZnCl_2$, Ca bentonite + $ZnCl_2$, H bentonite + $ZnCl_2$ and for Zn bentonite + NaCl, Zn bentonite + $CaCl_2$, and Zn bentonite + HCl. The uptake of Zn from $ZnCl_2$ solutions involves Zn^{++}, $(ZnCl)^+$, and $(ZnOH)^+$. The release of Zn from Zn clay by NaCl and $CaCl_2$ is restricted to divalent Zn. Zn clay has a mosaic surface capable of independent cation and anion exchange. The approximate constitution of the mosaic adsorption layer is indicated.

2620 541.183.25 : 677

Drying of textiles. WALKER, A. C. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 329–336, *May*, 1943.—A comprehensive report is given of an investigation into the effects of temperature and humidity on the phys. and chem. properties of important textile fibres. This includes: Drying-research objectives; discussion of moisture-relation data; hysteresis effects; com-

ined effects of heat and humidity on textiles during rying; effects of finishing and scouring agents on oisture relations; package-drying of cotton; with a oncluding discussion of the theory of moisture dis- ribution. It follows from the results, that it may be ighly undesirable to remove all or part of the initial onomolecular layer of moisture from the internal urfaces of such materials. Too thorough or uneven rying may impair the valuable properties of flexi- ility, softeners and strength. H. H. HO.

2621 541.183.6

On the theory of chromatography. WEISS, J. *J. hem. Soc., pp.* 297–303, *July*, 1943.—A general theory or the formation of a chromatogram from a single ubstance and the process of development by a solvent s discussed for several adsorption isotherms. An ttempt is made to correlate the theory with experi- nental results.

2622 541.183.6

An experimental study of chromatography. WEIL-MALHERBE, H. *J. Chem. Soc., pp.* 303–312, *July*, 1943.—Simple chromatographic systems consisting of one adsorbent, one adsorptive, and one solvent were studied by plotting the quantity of adsorptive in the filtrate against the total volume of the filtrate. The resulting elution curve is of sigmoid form. The volume of filtrate collected up to the beginning of elution is called the threshold volume, V_t. The shape of the elution curve depends on the exponential coeff. of Freundlich's adsorption isotherm. The mean conc. of the eluate was $\propto 1/V_t$. The results are discussed on the basis of the theory [Abstr. 2621 (1943)].

See Abstr. 2525 541.265 : 532.133 : 532.612.4

2623 541.6 = 3

On the constitution of *o*-oxy-carboxylic acids in solutions. CSOKÁN, P. *Z. phys. Chem. A*, 191, *pp.* 164–179, *Aug.*, 1942.—By investigating the ultra-violet absorption of phenol, benzoic aldehyde and derivatives and salts of *o*- and *m*-oxybenzoic acid in various solvents, e.g. C_2H_5OH, H_2O, NaOH, $HClO_4$, $CHCl_3$, and CCl_4, conclusions are drawn on the constitution of *o*-oxy-carboxylic acid, especially concerning the intermolecular H bridge and polymerization. The H bridge is effected by interaction of ionization, induction and mesomeric transformation. R. N.

See Abstr. 2597 541.6 : 541.123.2/.3 = 3

2624 541.63 : 541.124

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2625 541.634 : 541.124

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2626 541.653.3

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See Abstr. 2585 541.68 : 539.26

See Abstr. 2561 547.962.3 : 541.132.3 : 536.4

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2627 548.0 : 531.7 = 3

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2632 550.385

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2633 550.389

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2634 550.834.5

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2635 550.834.5

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2636 550.837

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2637 550.837.7 : 621.396.9 = 3

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2638 551 : 621.396.8

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2639 551.506.2(73)

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See Abstr. 2530, 2531 551.573 : 532.72

2642 551.578.4 : 679.52

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2643 551.58 : 634.22(794)

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2644 553.677 : 621.315.613.1

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See Abstr. 2613 591.111 : 541.132.3 = 3

See Abstr. 2554 591.111.2 : 535.653.33

See Abstr. 2541 612.85 : 534.756

See Abstr. 2512 616.314 : 53

See Abstr. 2643 634.22 : 551.58(794)

See Abstr. 2539 669 : 620.19 : 534.321.9

See Abstr. 2598 669.14 : 541.123.2

2645 669.21

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See Abstr. 2599 669.71 : 541.123.2 = 3

See Abstr. 2519 677 : 531.754.6 = 3

See Abstr. 2620 677 : 541.183.25

See Abstr. 2558 679.5 : 535.81

See Abstr. 2559 679.5 : 535.83

See Abstr. 2642 679.52 : 551.578.4

See Abstr. 2611 772.1 : 541.128